

Patent claims

Procedure for Representing a Technical Dental Object as well as for Manufacturing Artificial Dentures

1. Procedure for representing a technical digital object, such as artificial dentures or at least a model of a tooth or the area of the jaw which will be provided with the artificial dentures, on a screen, on the basis of a right-angled coordinate system with X, Y and Z axes, whereby the Z-axis and the Y-axis and the intersection (origin of the coordinate systems) in the representation plane of the screens and the X-axis run perpendicular to the representation plane and the technical dental object is rotated around two axes running perpendicular to each other and is shifted along the X-axis for zooming the object, characterized in that the technical dental object is aligned along a stretched plane, in which the X-axis and the Y-axis run, and the T-axis established the origin of the coordinate system and is moved around a maximal five degrees of freedom, whereby a rotation (Rot_z) is chosen as the first degree of freedom around the Z-axis, a rotation (Rot_t) is chosen as the second degree of freedom around the T-axis, a translation of the object along the T-axis is chosen as the third degree of freedom and the translation of the object along the X-axis is chosen as the fourth degree of freedom.

2. Procedure according to claim 1, characterized in that the technical dental object is maximally moved around the first, second, third and fourth degrees of freedom.

3. Procedure according to claim 1, characterized in that as a fifth degree of freedom, a rotation (Rot_x) of the object around the X-axis is chosen.

4. Procedure according to claim 1, characterized in that the technical dental object is maximally rotated around an angle around the T-axis, whereby $\alpha < 360^\circ$, particularly $\alpha \leq 180^\circ$ is selected.

5. Procedure according to claim 1,
characterized in that the technical dental object is represented on the screen in such a way
that the technical dental object is established independent of its movement or
representation from the origin of the coordinate system.
6. Procedure according to claim 1,
characterized in that the longitudinal axis of the technical dental object is formed through
a traverse with the connected straight lines of the sections of the technical dental object,
that for shifting of the technical dental object along the T-axis the technical dental object
is shifted along a straight line of the traverse, which establishes the origin of the
coordinate system.
7. Procedure according to claim 6,
characterized in that by shifting the technical dental object along the first and second
straight lines, which follow each other and contain an angle β where $\beta \neq 180^\circ$ after
completing the shifting along the first straight line before shifting the technical dental
object along the second straight line, the technical dental object is rotated around an angle
 β around the Z-axis.
8. Procedure according to at least claim 1,
characterized in that a reduced translation of the object results along the T-axis.
9. Procedure according to at least claim 1,
characterized in that the coordinate system with its origin is specified on the screen in
such a way that the origin remains independent of the movement of the object in fixed
position on the screen.
10. Procedure according to at least claim 1,
characterized in that the coordinate origin is placed approximately in the center of the
screen.

11. Procedure according to at least claim 1,
characterized in that the reduced rotation is realized around the T-axis (second degree of freedom) by the object rotating to and from.
12. Procedure according to at least claim 1,
characterized in that at aligning the object on the screen, the input device used exhibits input element, over which the alignment of the object is arranged around the respective degree of freedom separated from each other.
13. Procedure according to at least claim 9,
characterized in that as an input device, such a one with four input elements is used.
14. Procedure according to at least claim 9,
characterized in that as an input element, a changeover switch is used for duplicating a further input element.
15. Procedure according to at least claim 9,
characterized in that as one or several input elements an adjusting wheel is used.
16. Procedure according to at least one of the preceding claims,
characterized in that as the input device, a function of at least two input elements of an exercised trackball.
17. Procedure according to at least claim 9,
characterized in that by using a trackball (ball) as one of the input elements, the object is rotated around the first and second axis, as well as around an axis that runs perpendicular to this axis through a similar rotation of the trackball.
18. Procedure according to at least claim 9,

characterized in that the object through optional operation of an individual input element, as well as combinatory operation of two input elements is moved around four degrees of freedom in a limited fashion.

19. Procedure for manufacturing artificial dentures on the basis of digitized data of a jaw area which is to be provided with the artificial dentures, assessing the artificial dentures based on the digitized data and representation at least of the artificial dentures on a screen, evaluating the represented artificial dentures through moving the artificial dentures on the screen maximally around five degrees of freedom, and, if necessary, changing the represented artificial dentures and the subsequent manufacture of the artificial dentures on the basis of the data that correspond to the represented artificial dentures.

20. Procedure according to claim 19, characterized in that the artificial dentures and the jaw area to be provided with the artificial dentures be represented on the screen.

21. Procedure according to claims 19 and 20, characterized in that assessing the artificial dentures based on the digitized data of the jaw area to be provided with the artificial dentures with stored parameters, such as wall thickness of the artificial dentures or cement gap between the artificial dentures and jaw area combined and from such data attained, the artificial dentures are assessed and represented on the screen.

22. Procedure according to at least claim 19, characterized in that the artificial dentures, which are represented on the screen, are modeled by an electronic change of the data.

23. Procedure according to at least claim 19, characterized in that the artificial dentures and/or the jaw area is maximally shifted around four degrees of freedom on the screen.

19. Procedure for manufacturing artificial dentures on the basis of digitized data of a jaw area which is to be provided with the artificial dentures, assessing the artificial dentures based on the digitized data and representation at least of the artificial dentures on a screen, according to claim 1, evaluating the represented artificial dentures through moving the artificial dentures on the screen maximally around five degrees of freedom, and, if necessary, changing the represented artificial dentures and the subsequent manufacture of the artificial dentures on the basis of the data that correspond to the represented artificial dentures.

20. Procedure according to claim 19, characterized in that the artificial dentures and the jaw area to be provided with the artificial dentures be represented on the screen.

21. Procedure according to claims 19 and 20, characterized in that assessing the artificial dentures based on the digitized data of the jaw area to be provided with the artificial dentures with stored parameters, such as wall thickness of the artificial dentures or cement gap between the artificial dentures and jaw area combined and from such data attained, the artificial dentures are assessed and represented on the screen.

22. Procedure according to at least claim 19, characterized in that the artificial dentures, which are represented on the screen, are modeled by an electronic change of the data.

23. Procedure according to at least claim 19, characterized in that the artificial dentures and/or the jaw area is maximally shifted around four degrees of freedom on the screen.

[AMENDED SHEET]